Sept. 27, 1966 G. A. LUKAS 3,274,708

AIR CIRCULATORY INSOLE

Filed Oct. 14, 1965 3 Sheets-Sheet 1

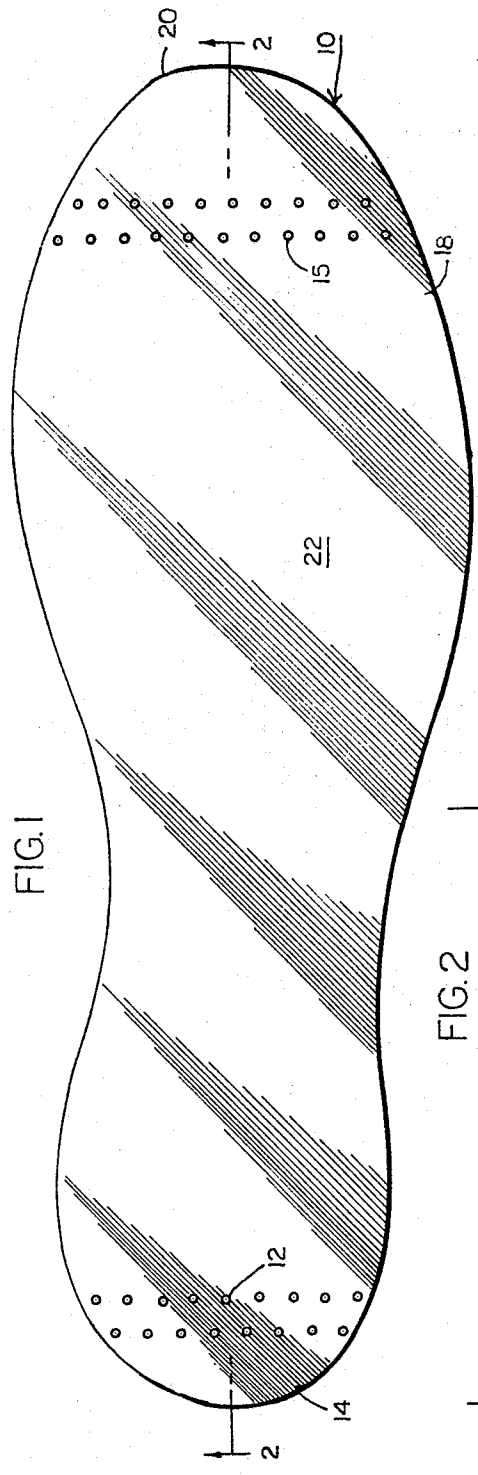


FIG. 1

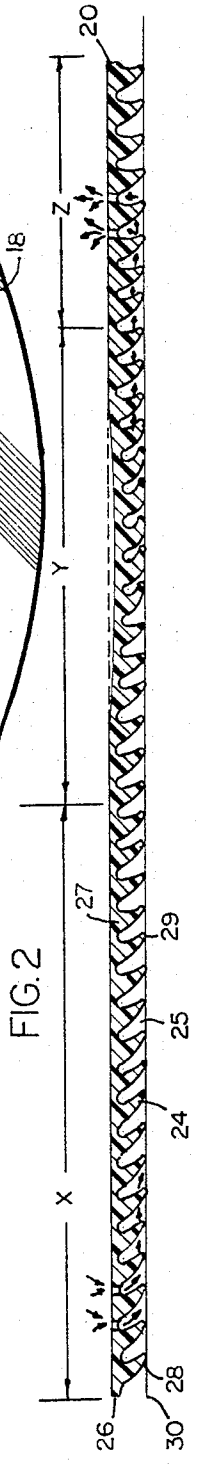


FIG. 2

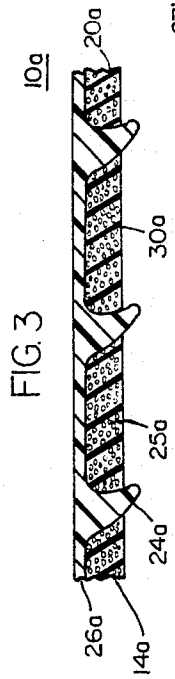


FIG. 3

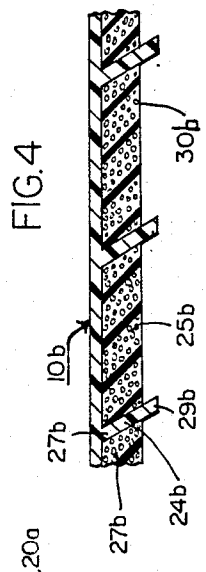


FIG. 4

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AIR CIRCULATORY INSOLE

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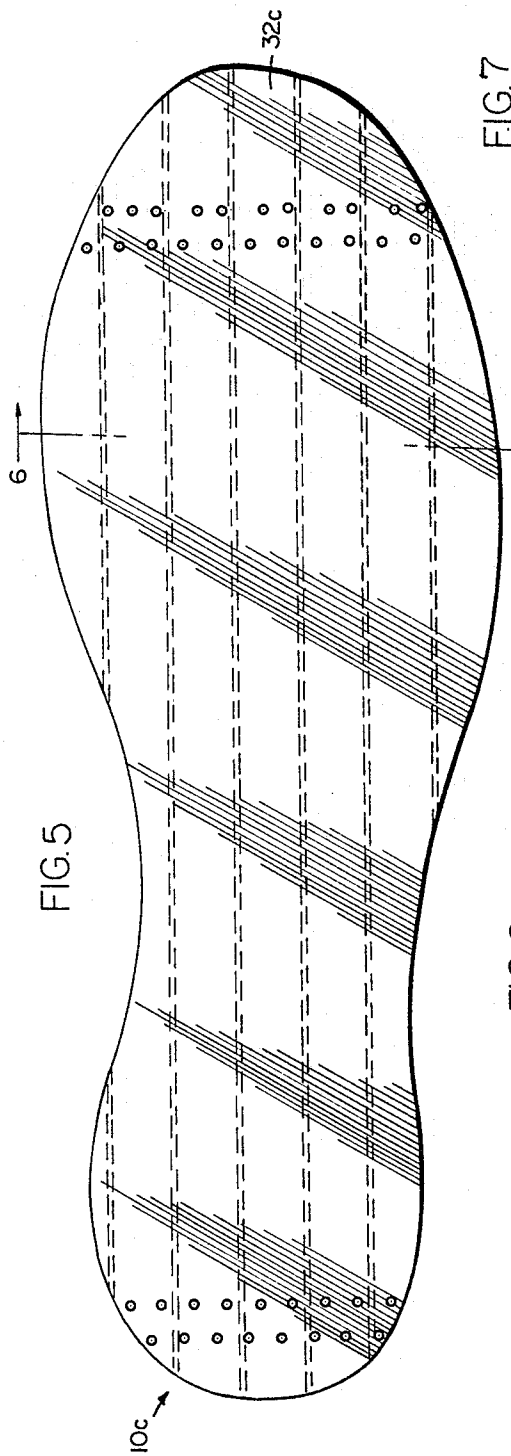


FIG. 5



FIG. 7

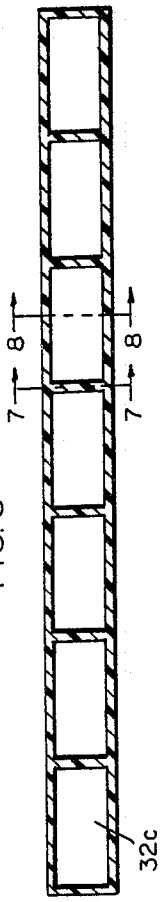


FIG. 6

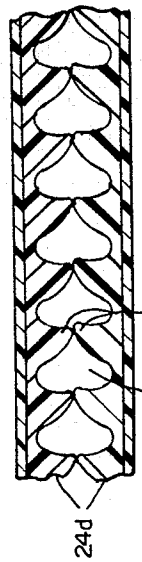


FIG. 9



FIG. 8

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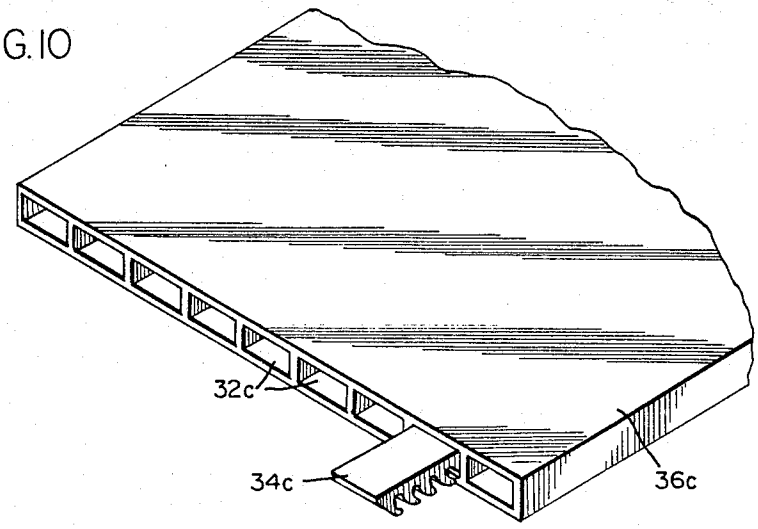
ATTORNEY

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FIG. 10



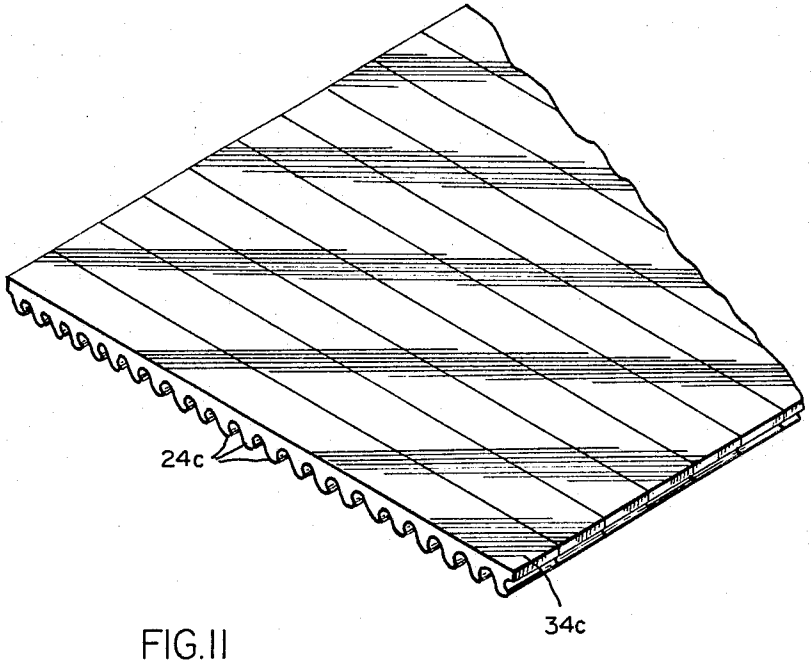


FIG. 11

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3,274,708

AIR CIRCULATORY INSOLE

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Filed Oct. 14, 1965, Ser. No. 495,855
1 Claim. (Cl. 36—3)

This invention relates generally to insoles for shoes and more particularly to an improved insole construction wherein resilient angular projections both cushion the wearer and control the flow of air through the shoe.

There have heretofore been many varieties of designs for cushioning insoles adapted for use either as an integral part of a shoe or as a removable unit. The majority of these constructions are made of a sponge type material where the basic requirement is compressibility. Furthermore, the problem of ventilating a shoe by providing various types of insoles containing venturi chambers and spacing ribs has been attempted in the past.

However, the primary problem of providing a cushioning insole to directionally control the flow of air from the heel to the toe of the shoe has yet to be solved. It is well known that the toe portion of the average shoe, being a confined area, does not receive a supply of air normally present in the heel.

Therefore, it is an object of this invention to provide an improved insole for directionally controlling the flow of air through a shoe.

It is another object of this invention to provide a cushioning insole having a series of integral angularly inclined spacing members defining air chambers.

It is a further object of this invention to provide a cushioning insole wherein a series of laterally aligned air chambers are sequentially compressed during the use of the shoe.

It is still another object of this invention to provide a cushioning insole having a series of individual compartments on the lower surface thereof which act as individual pumping chambers when the upper surface of the insole is stressed.

Other objects of this invention will in part be obvious and will in part appear hereinafter.

Broadly stated one feature of this invention is to provide a cushioning insole which may be an integral portion of the shoe or may be supplied independent of the shoe for insertion therein, which provides a series of downwardly extending, angularly inclined resilient supporting members which are laterally spaced from each other defining a series of air compartments. The insole when positioned within a shoe forms a channel the sides of which are formed by the inner area of the shoe surface. During the normal walking operation these members are sequentially compressed forcing the air contained in each of the compartments to an adjacent compartment thereby undirectionally controlling the flow of air throughout the lower portion of the shoe.

To the accomplishment of this and the foregoing related ends, the present invention then consists of the means hereinafter fully described and particularly pointed out in the claim, the annexed drawings and the following description setting forth in detail certain means in the carrying out of the invention, such disclosed means illustrating however but one of the various ways in which the principle of this invention may be employed.

In the drawings:

FIG. 1 is a top plan view of the insole embodying the invention.

FIG. 2 is a view in section taken on line 2—2 of FIG. 1.

FIG. 3 is an enlarged fragmentary view in section of a modified form of this invention.

FIG. 4 is an enlarged fragmentary view of another modification of this invention.

FIG. 5 is a top plan view of another modification of this invention.

FIG. 6 is a view in section taken on line 6—6 of FIG. 5.

FIG. 7 is a view in section taken on line 7—7 of FIG. 6.

FIG. 8 is a view in section taken on line 8—8 of FIG. 6.

FIG. 9 is a view in section of still a further modified form of this invention.

FIG. 10 is a view in perspective of one method of manufacturing the insole.

FIG. 11 is a view in perspective of one step in the manufacturing of the insole.

Reference is now to be had to the drawings wherein an illustrative embodiment of the insole, a construction made in accordance with the present invention and designated by the reference numeral **10** as shown.

The insole **10** may be made of various impervious or semi-permeable plastomers or elastomers or of artificial leather or any of the various poromeric materials and may be of hollow construction or contain fillers of fibrous or porous materials.

Referring to FIG. 1, there is illustrated the insole **10**, having a configuration adaptable for insertion with a shoe. A series of air intake ports **12**, transversely spaced from each other, extend through the thickness of the insole and are located at points spaced from heel **14** of the insole. A similar series of air discharge ports **15**, extend transversely across the toe portion **18** of the insole at points spaced from toe **20** of the insole. The remaining surface **22** of the insole is imperforate for reasons which will be fully set forth hereinafter.

In FIG. 2, which is a longitudinal section of the insole **10**, are shown a series of resilient support members **24** angularly extending downward from the upper portion **26** of the insole **10**, with each member **24** separated from each other by a compartment **25** and with an enlarged base **27** and a narrow tip **29**. Each of these members **24** are tooth shaped and their angular relationship with the upper portion **26** of the insole **10** inclines the member in the direction of the toe **20** so that a portion of the trailing edge **28** bears against the upper surface of the shoe sole **30**. The angular relationship of the members **24** with the insole **10** is greater than 90°.

FIG. 2 which represents the entire cross section of the insole has been represented as three zones of stress, *x*, *y* and *z* for purposes of defining the action of the members **24** during actual operation of the insole. Zone *x* shows that portion of the members **24** in the unloaded position, zone *y* is the loaded position wherein the members **24** have been deflected due to the weight of the body so that a greater portion of the trailing edge **28** bears on the sole **30** and the area of the compartment **25** is reduced, zone *z* just prior to loading and at the terminal end of the stress area.

In FIG. 3 there is shown a modified form of the invention in which the insole **10** has the series of tooth shaped members **24***a* longitudinally spaced from each other and extending from the upper portion **26***a* and angularly inclined away from the heel **14***a* towards the toe **20***a*. The area or compartments **25***a* disposed between each of the tooth members **24***a* contain a porous filler material **30***a* such as sponge, rubber or the like for a purpose to be set forth more fully hereinafter.

In FIG. 4, there is still another modified form of the invention wherein the insole **10***b* has a series of angularly inclined downwardly extending members **24***b* of uniform thickness from base **27***b* to tip **29***b*. The compartments **25***b* between the members **24***b* contain porous filler materials **30***b*.

In FIGURES 5–8 and FIGURES 10–11 there is shown another modification of this invention wherein the insole **10***c* has a series of laterally spaced channels **32***c* formed therein adapted to receive strips of the members **24***c*.

In FIG. 9 there is illustrated a still further modification of this invention wherein two opposing rows of members **24***d* having their tips **29***c* abut against each other to provide larger compartments **25***d* between the members **24***d* which reduces the friction between the opposing members.

FIGURES 10–11 illustrate steps in the manufacture of the modified form of the invention as set forth in FIGURES 5–8. In FIG. 11, the mass of material having the tooth like members **24***c* can be extruded and cut into strips **34***c*. The carrier **36***c* also can be extruded in a mass having the channels **32***c* formed therein. By inserting the strips **34***c* into the channels any desired number of insoles may be simply and easily stamped from the mass.

Operation of the invention

This invention is designed to effect the transfer of air from the heel portion of the shoe towards the toe by means of the walking action of the shoe wearer.

The actual operation is best illustrated by refering to FIG. 2, wherein air is permitted to enter through the insole by means of the air intake ports **12**. As the foot compresses the insole **10**, the weight causes the tooth members **24** to deflect and due to their angular configuration a greater portion of the trailing edge bears on the shoe surface reducing the area of the compartment **25** and forcing the air contained therein toward the toe **20**. The pressure thus created within the insole forces the air upwards through the discharge ports **15**; when the foot is raised, the members **24**, due to their resilient characteristics resume their original position causing a pressure differential and allowing air to be drawn in from the intake ports **12**. In this manner the insole acts like a pump circulating air from the rear towards the toe portion of the shoe.

By partially filling the compartments with a porous filler material **30***a*, as shown in FIGURES 3 and 4, the number of tooth members **24***a* may be reduced allowing larger compartments **25***a* permitting greater quantities of air to be contained therein.

While there have been described herein what are at present considered preferred embodiments of the invention it will be obvious to those skilled in the art that modifications and changes may be made therein without departing from the essence of this invention. It is therefore to be understood that the exemplary embodiments are illustrative and not restrictive of the invention, the scope of which is defined in the appended claim, and that all modifications that come within the meaning and range of equivalency of the claim are intended to be included therein.

I claim:

An insole for foot wear, comprising,

(a) a resilient body having an upper imperforate median surface,

(b) air intake ports disposed adjacent one distal end and extending transversely across said body,

(c) air discharge ports extending transversely across the other distal end of said body,

(d) a plurality of resilient support members extending downwardly from said body and angularly declined in the direction of said discharge ports, the angle of said support members with said body being greater than 90°,

(e) each of said support members extending completely across said body and being longitudinally spaced from each other defining compartments therebetween,

whereby said support members are deflected during walking directionally controlling the flow of air from the intake ports to the discharge ports.

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